We claim:

1. A B-stageable underfill encapsulant, wherein the encapsulant solidifies during the B-stage process to produce a smooth, non-tacky surface on a semiconductor wafer or silicon chip.

2. The B-stageable encapsulant of claim 1 comprising:

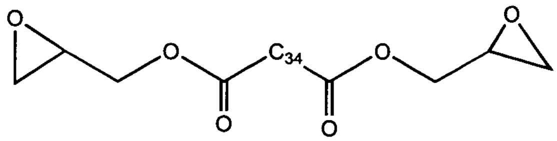
a) a thermal curable resin system comprising an admixture of at least one epoxy resin and at least one phenol-containing compound;

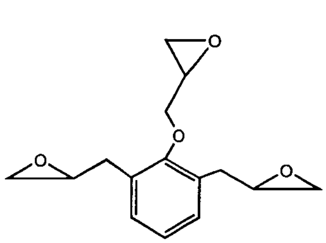
b) an imidazole-anhydride adduct;

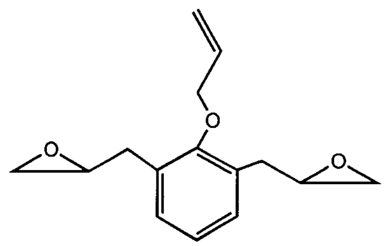
c) at least one solvent; and

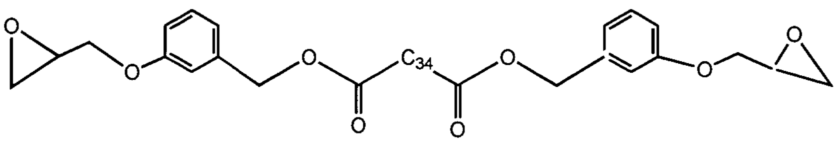
d) at least one inorganic filler.

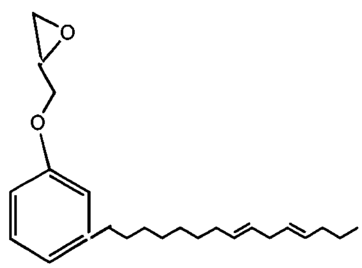
3. The encapsulant of claim 2, wherein the at least one epoxy resin is selected from the group comprising monofunctional and multifunctional glycidyl ethers of Bisphenol-A, monofunctional and multifunctional glycidyl ethers of Bisphenol-F, aliphatic epoxies, aromatic epoxies, saturated epoxies, unsaturated epoxies, cycloaliphatic epoxy resins, epoxies having the structures











or mixtures thereof.

4. The encapsulant of claim 3, wherein the at least one epoxy resin is selected from the group consisting of 3,4-epoxycyclohexylmethyl-3,4-epoxycyclohexane carboxylate, vinylcyclohexene dioxide, 3,4-epoxy-6-methyl cyclohexyl methyl-3,4-epoxycyclohexane carboxylate, dicyclopentadiene

dioxide, bisphenol A resin, bisphenol F type resin, epoxy novolac resin, poly(phenyl glycidyl ether)-co-formaldehyde, biphenyl type epoxy resin, dicyclopentadiene-phenol epoxy resins, naphthalene epoxy resins, epoxy functional butadiene acrylonitrile copolymers, epoxy functional polydimethyl siloxane, and mixtures thereof.

5. The encapsulant of claim 2, wherein the phenol-containing compound is selected from the group comprising phenolic resin, phenol or mixtures thereof.

6. The encapsulant of claim 5, wherein the phenolic-containing compound comprises phenolic novalac resin, dially bisphenol-A, bisphenol-A or mixtures thereof.

7. The encapsulant of claim 4, wherein the at least one epoxy resin comprises in the range of about 0.1 wt % to about 99.9 wt % of the epoxy/phenolic-containing compound admixture.

8. The encapsulant of claim 5, wherein the epoxy resin comprises in the range of about 40 wt % to about 95 wt % of the encapsulant.

9. The encapsulant of claim 8, wherein the at least one phenolic-containing compound comprises in the range of about 0.1 wt % to about 99.9 wt % of the epoxy/phenolic-containing compound admixture.

10. The encapsulant of claim 9, wherein the at least one phenolic-containing compound comprises in the range of about 5 wt % to about 60 wt % of the epoxy/phenolic-containing compound admixture.

11. The encapsulant of claim 9, wherein the at epoxy/phenolic-containing admixture comprises in the range of about 20 wt % to about 80 wt % of the encapsulant.

12. The encapsulant of claim 2, wherein the imidazole-anhydride adduct comprise an adduct of imidazole and anhydride selected from the group comprising pyromellitic dianhydride, methylhexa-hydro phthalic anhydride methyltetra-hydrophthalic anhydride, nadic methyl anhydride, hexa-hydro phthalic anhydride, tetra-hydro phthalic anhydride, dodecyl succinic anhydride, phthalic anhydride, bisphenyl dianhydride, benzophenone tetracarboxylic dianhydride, 1-cyanoethyl-2-ethyl-4-methyl-imidazole, alkyl-substituted imidazole, triphenylphosphine, onium borate, non-N-substituted imidazoles, 2-phenyl-4-methyl imidazole, 2-ethyl-4-methyl-imidazole, 2-phenyl imidazole, imidazole, N-substituted imidazole and mixtures thereof.

13. The encapsulant of claim 12, wherein the imidazole-anhydride adduct comprise an adduct of 2-phenyl-4-methyl imidazole and pyrometillic dianhydride.

14. The encapsulant of claim 13, wherein the imidazole-anhydride adduct comprises in the range of about 0.01 wt % to about 10 wt % of the encapsulant.

15. The encapsulant of claim 13, wherein the imidazole-anhydride adduct comprises in the range of about 0.1 wt % to about 5 wt % of the encapsulant.

16. The encapsulant of claim 2, wherein the at least one solvent is selected from the group comprising solvents that are stable and dissolve the epoxy and phenolic resins in the composition.

17. The encapsulant of claim 16, wherein the at least one solvent iis selected from the group comprising ketones, esters, alcohols, ethers, γ-butyrolactone and propylene glycol methyl ethyl acetate (PGMEA) and mixtures thereof.

18. The encapsulant of claim 17, wherein the at least one solvent comprises γ-butyrolactone and propylene glycol methyl ethyl acetate (PGMEA) and mixtures thereof.

19. The encapsulant of claim 17, wherein the solvent comprises in up to about 60 wt % of the encapsulant.

20. The encapsulant of claim 2, wherein the at least one inorganic filler is selected from the group comprising vermiculite, mica, wollastonite, calcium carbonate, titania, sand, glass, fused silica, fumed silica, alumina, barium sulfate, and halogenated ethylene polymers, such as tetrafluoroethylene, trifluoro-ethylene, vinylidene fluoride, vinyl fluoride, vinylidene chloride, vinyl chloride and mixtures thereof.

21. The encapsulant of claim 20, wherein the at least one inorganic filler is silica.

22. The encapsulant of claim 20, wherein the inorganic filler comprises in the up to about 70 wt % of the encapsulant.

23. The encapsulant of claim 2 further comprising at least one fluxing agent.

24. The encapsulant of claim 23 wherein the at least one fluxing agent is selected from the group comprising carboxylic acids, rosin gum, dodecanedioic acid, adipic acid, sebasic acid, polysebasic polyanhydride, maleic acid, tartaric acid, citric acid, alcohols, hydroxyl acid and hydroxyl base, polyols such as ethylene glycol, glycerol, 3-[bis(glycidyl oxy methyl) methoxy]-1,2-propane diol, D-ribose, D-cellobiose, cellulose, 3-cyclohexene-1,1-dimethanol, and mixtures thereof.

25. The encapsulant of claim 24, wherein the at least one flux agent comprises rosin gum, dodecanedioic acid, adipic acid, or mixtures thereof.

26. The encapsulant of claim 25, wherein the at least one flux agent comprises in the range of about 0.5 wt % to about 20 wt % of the encapsulant.

27. The encapsulant of claim 26, wherein the at least one flux agent comprises in the range of about 1 wt % to about 10 wt % of the encapsulant.

28. The encapsulant of claim 2, wherein the encapsulant further comprises one or more of group consisting of surfactants, coupling agents, reactive diluents, air release agents, flow additives, adhesion promoters and mixtures thereof.

29. The encapsulant of claim 28 wherein the surfactant is selected from the group consisting of organic acrylic polymers, silicones, epoxy silicones, polyoxyethylene/polyoxypropylene block copolymers, ethylene diamine based polyoxyethylene/polyoxypropylene block copolymers, polyol-based polyoxyalkylenes, fatty alcohol-based polyoxyalkylenes, fatty alcohol polyoxyalkylene alkyl ethers and mixtures thereof.

30. The encapsulant of claim 28 wherein the reactant diluent is selected from the group comprising p-tert-butyl-phenyl-glycidyl ether, allyl glycidyl ether, glycerol diglycidyl ether, glycidyl ether of alkyl, butanediodiglydidylether and mixtures thereof.

31. The encapsulant of claim 2 wherein the underfill encapsulant is applied to a semiconductor wafer and B-stage processed before the semiconductor wafer is diced into individual chips.

32. A silicon wafer having a B-stageable underfill composition deposited on one face of the wafer, the B-stageable composition comprising

a) a thermal curable resin system comprising an admixture of at least one epoxy resin and at least one phenol-containing compound;

b) an imidazole-anhydride adduct;

c) at least one solvent; and

d) at least one inorganic filler.

33. A method of preparing one or more silicon chips, comprising the steps of

a) applying the encapsulant of claim 2 to a semiconductor wafer;

b) B-stage processing the encapsulant on the semiconductor wafer so that the encapsulant solidifies into a smooth, non-tacky coating; and

c) dicing the semiconductor wafer into individual silicon chips.

34. The method of claim 33, wherein the encapsulant is applied to the semiconductor wafer via spin coating, screen printing or stencil printing.

35. A method of preparing an electronic package comprising the steps of

a) applying the encapsulant of claim 2 to a semiconductor wafer;

b) B-stage processing the encapsulant on the semiconductor wafer so that the encapsulant solidifies into a smooth, non-tacky coating;

c) dicing the semiconductor wafer into more than one silicon chip, with each chip having a first side coated with the encapsulant;

d) placing one or more silicon chips on a substrate so that the first side of the silicon chip is adjacent to the substrate; and

e) heating the substrate and at least one silicon chip to a temperature sufficient to form interconnections between the at least one silicon chip and the substrate and cure the encapsulant.

36. The method of claim 35, comprising the additional step of placing an unfilled liquid curable fluxing material on the substrate before the silicon chip is placed on the substrate.

37. The method of claim 36, wherein the unfilled liquid curable fluxing material comprises

a) a thermal curable resin system comprising an admixture of at least one epoxy resin and at least one phenol-containing compound;

b) an imidazole-anhydride adduct; and

c) at least one fluxing agent.

38. The method of claim 37, wherein the imidazole-anhydride adduct comprise an adduct of imidazole and anhydride selected from the group comprising pyromellitic dianhydride, methylhexa-hydro phthalic anhydride methyltetra-hydrophthalic anhydride, nadic methyl anhydride, hexa-hydro phthalic anhydride, tetra-hydro phthalic anhydride, dodecyl succinic anhydride, phthalic anhydride, bisphenyl dianhydride, benzophenone tetracarboxylic dianhydride, 1-cyanoethyl-2-ethyl-4-methyl-imidazole, alkyl-substituted imidazole, triphenylphosphine, onium borate, non-N-substituted imidazoles, 2-phenyl-4-methyl imidazole, 2-ethyl-4-methyl-imidazole, 2-phenyl imidazole, imidazole, N-substituted imidazole and mixtures thereof.

39. The encapsulant of claim 38, wherein the imidazole-anhydride adduct comprise an adduct of 2-phenyl-4-methyl imidazole and pyrometillic dianhydride.